

CHAPTER 4

OPERATIVE DENTISTRY

INTRODUCTION

Operative dentistry is the area of dental practice concerned with the prevention and treatment of defects in tooth enamel and dentin. Since many patients need treatment that is provided in operative dentistry, this is where most of the dental assistants are assigned. Operative dentistry includes the treatment and restoration of carious teeth with metallic and nonmetallic dental materials. These materials are usually amalgam, composite resins, and glass ionomer restorations.

PURPOSE

Operative dentistry provides treatment to restore a patient's dental condition to a healthy, functional, and esthetically (pleasing to the eye) acceptable level. Operative dentistry primarily is responsible for the restoration of decayed or fractured teeth. This chapter provides information and procedures that you may be required to perform in operative dentistry.

AREAS OF OPERATIVE DENTISTRY

You must be aware that each operative procedure may not be performed in the same manner. Basic procedures are usually performed during each operative appointment. Some of these procedures are also used in other dental specialties. The areas discussed in this chapter are as follows:

- Identification of operative instruments
- Miscellaneous instruments, materials, and equipment
- Four-handed dentistry
- Basic dental procedures
- Operative procedures
- Supply procedures

IDENTIFICATION OF OPERATIVE INSTRUMENTS

Because of the many hard to reach areas in the human mouth and various functions required,

operative instruments come in a wide variety of sizes and shapes. To be an effective dental assistant, you must be able to understand why, where, and when the dentist will use them. We will discuss hand cutting instruments, amalgam instruments that consist of condensers, carvers and burnishers, and composite (resin) instruments.

HAND CUTTING INSTRUMENTS

Many dental procedures require the use of hand instruments with sharp cutting edges. This cutting instrument group used in operative dentistry includes excavators, chisels, hatchets, hoes, and gingival margin trimmers. They are used in the cavity preparation of both amalgam and composite (resin) restorations.

Spoon Excavators

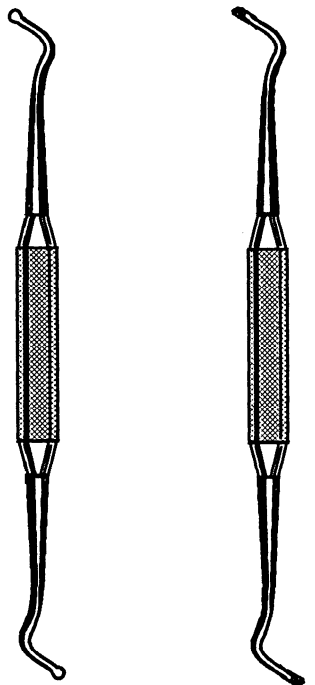
The spoon excavator is a double-ended instrument with a spoon, claw, or disk-shaped blade. Spoon excavators are used primarily to remove debris from tooth cavities. Their tips and sides are designed for cutting action. The most common sizes are the small and the large (fig. 4-1) spoon extractors.

Chisels

Dental chisels are commonly referred to as miniature chisels. Chisels are used to cleave (split) tooth enamel, to smooth cavity walls, and to sharpen cavity preparations. The two most common types used in operative dentistry are the Wedelstaedt and biangle chisels (fig. 4-2). The Wedelstaedts have slightly curved shanks and are used primarily on anterior teeth. The biangle chisels have two distinct angles—one at the shank, and one at the working end. This design allows access to tooth structures that would not be possible with straight chisels.

Hatchets

A dental hatchet (fig. 4-3) resembles a camper's hatchet, except much smaller. Like dental chisels, some have single cutting ends, and others have cutting edges on both ends of the handle. Hatchet blades are set

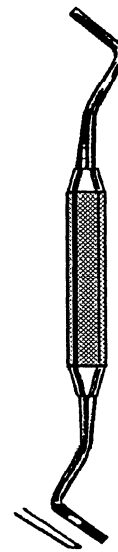


SMALL

LARGE

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Figure 4-1.—Small and large spoon excavators.



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Figure 4-3.—Hatchet.

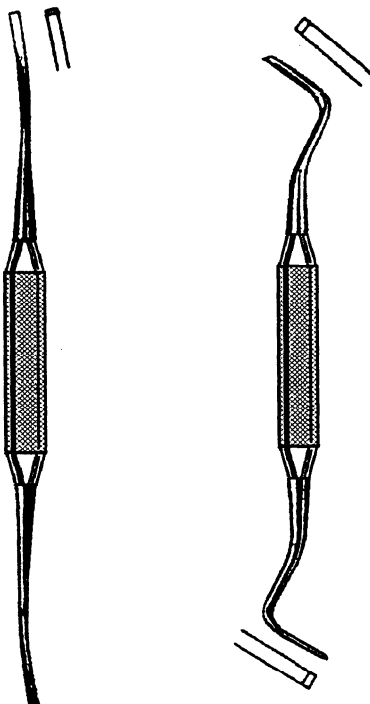
at a 45- to 90-degree angle from the shank. These instruments have different lengths and widths of blades. Hatchets are used on the wall of the cavity preparation to cleave enamel and cut dentin so there will be a sharp cavity outline.

Hoes

Dental hoes (fig. 4-4) look like a miniature garden hoe. They are used with a pulling motion to smooth and shape the floor and sides of cavity preparations. Hoe blades are set at a 45- to 90-degree angle from their handle.

Gingival Margin Trimmers (GMTs)

The gingival margin trimmers (GMTs) (fig. 4-5) are modified hatchets that have working ends with opposite curvatures and bevels. As the name implies, GMTs are used to trim, smooth, and shape the gingival floor of a cavity preparation. GMTs are available in double-ended styles and are used in pairs, such as the #26 and #27. This is because the working ends of the even-numbered instruments are designed for use on the **distal surfaces**, and the odd numbered are used on the **mesial surfaces**.



WEDELSTAEDTS

BIANGLE

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Figure 4-2.—Wedelstaedt and biangle chisels.

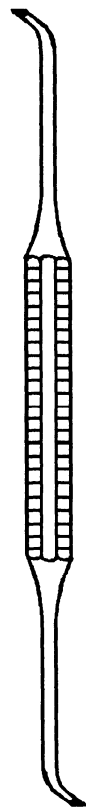
AMALGAM RESTORATION INSTRUMENTS

The instruments discussed in this section are used when the dentist elects to use an amalgam or a temporary dental material to restore a tooth.

Condensing Instruments

To deliver the amalgam to the cavity preparation and properly condense (pack) it, the dentist will use a variety of instruments. Amalgam carriers and condensers are used for this purpose.

AMALGAM CARRIERS.—Amalgam carriers (fig. 4-6) transport the freshly prepared amalgam restorative material to the cavity preparation. These carriers have hollow working ends, called barrels, into which the amalgam is packed for transportation. Both single and double-ended carriers are available with a variety of barrel sizes including: mini, large, and jumbo. When the lever (located on the top of the carrier) is depressed, the amalgam is ejected into the cavity preparation. Normally, two carriers are used during the amalgam placement procedure. This saves time for the dentist who is ejecting or condensing a carrier load while you are refilling the carriers. A poorly packed carrier of amalgam handed to the dentist may fall out before it is ejected into the cavity preparation. It is your responsibility to ensure that all carriers are properly packed before the transfer to the dentist. After amalgam material placement is completed, eject any remaining amalgam alloy from the carrier into the amalgam well. The carrier is no longer serviceable when the amalgam is allowed to harden in the carrier.



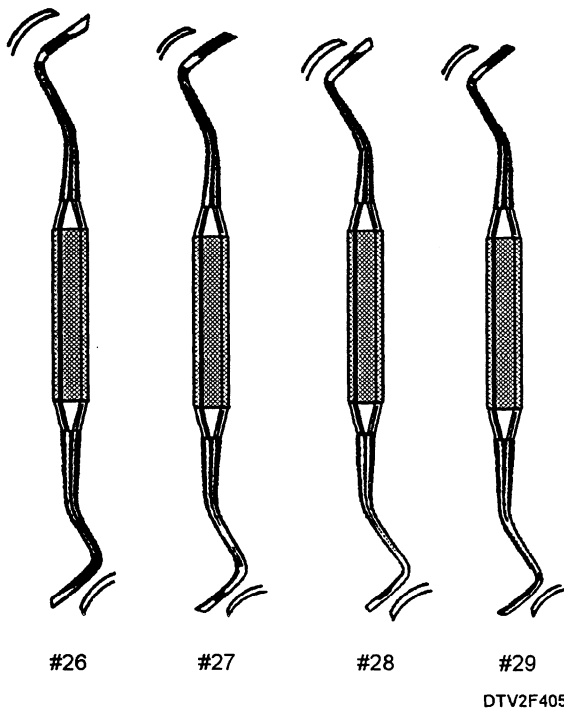
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Figure 4-4.—Hoe.

CONDENSERS.—Amalgam condensers, often called **pluggers**, are instruments used to condense or pack the amalgam filling materials into the cavity preparation. The hammer-like working end is large enough to compress the soft amalgam without sinking into it. Condensers come in single- and double-ended designs. They have various shaped and sized working ends, which may be smooth or serrated as shown in figure 4-7.

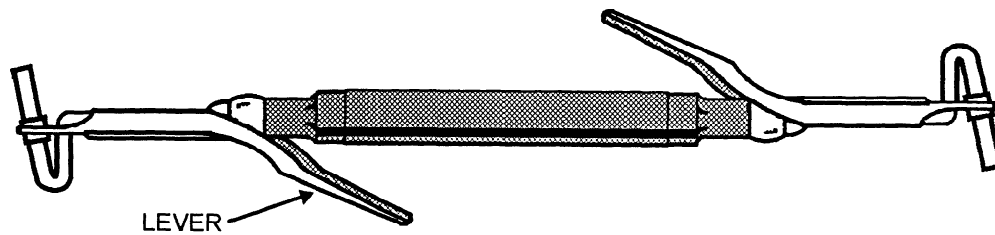
Carvers

After the amalgam is condensed, it must then be carved to approximately the same original tooth structure. Carvers have sharp cutting edges that are used to shape, form, or cut tooth anatomy into amalgam restorations. Figure 4-8 illustrates these instruments that come in assorted shapes and sizes in double-ended designs. Many carvers were designed for carving specific tooth surfaces. The Interproximal and #1/2 Hollenback were designed for carving proximal (in between) tooth surfaces; whereas, the discoid-cleoid #89/92 and Tanner #5 are used on occlusal surfaces. Carvers shaped similar to Vignion or Frahm #2/3 (also

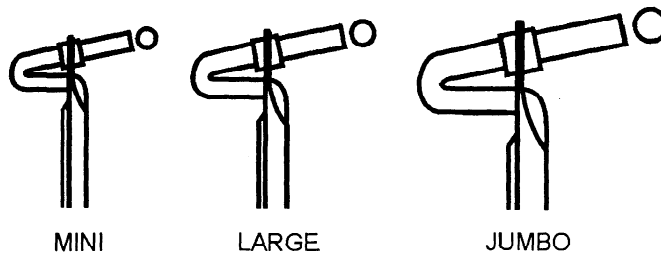


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Figure 4-5.—Gingival margin trimmers (GMTs).

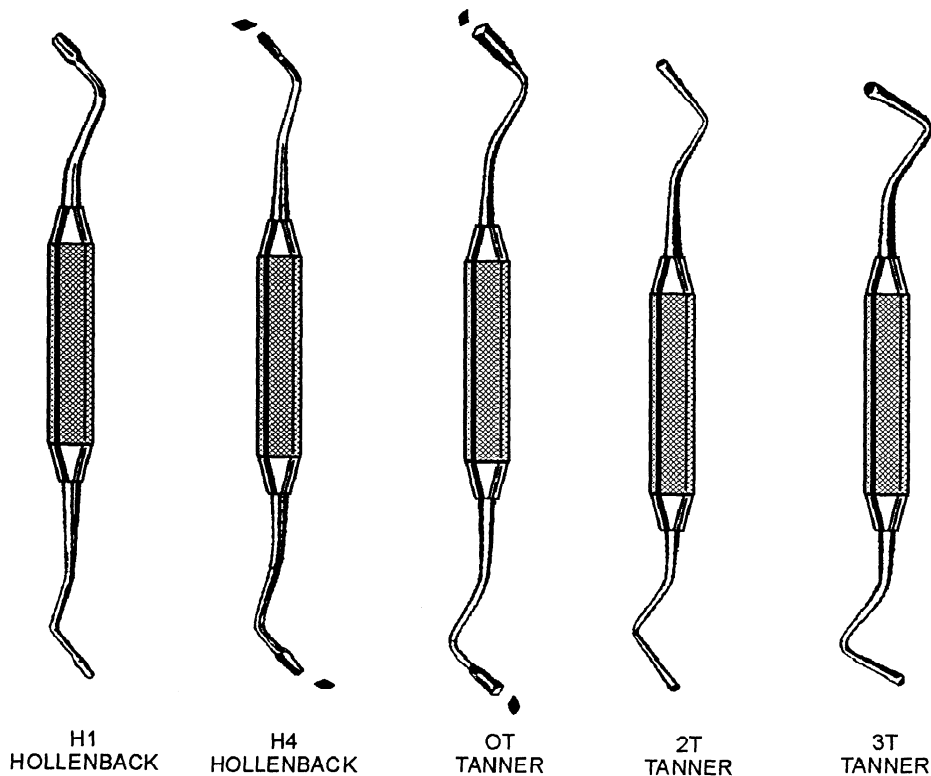


TIP SIZES FOR AMALGAM CARRIERS



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Figure 4-6.—Amalgam carriers.



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Figure 4-7.—Amalgam condensers.

called acorn carvers) are used to quickly carve the basic anatomy on occlusal surfaces. As with condensers, dentists also have favorite carvers that they use routinely. You must know the dentist's preference so that you can have the desired instrument ready when it is needed.

Burnishers

When the carving is complete, the dentist may use burnishers to smooth and polish the restoration, and to remove scratches left on the amalgam surface by a carving instrument. Burnishers have smooth rounded

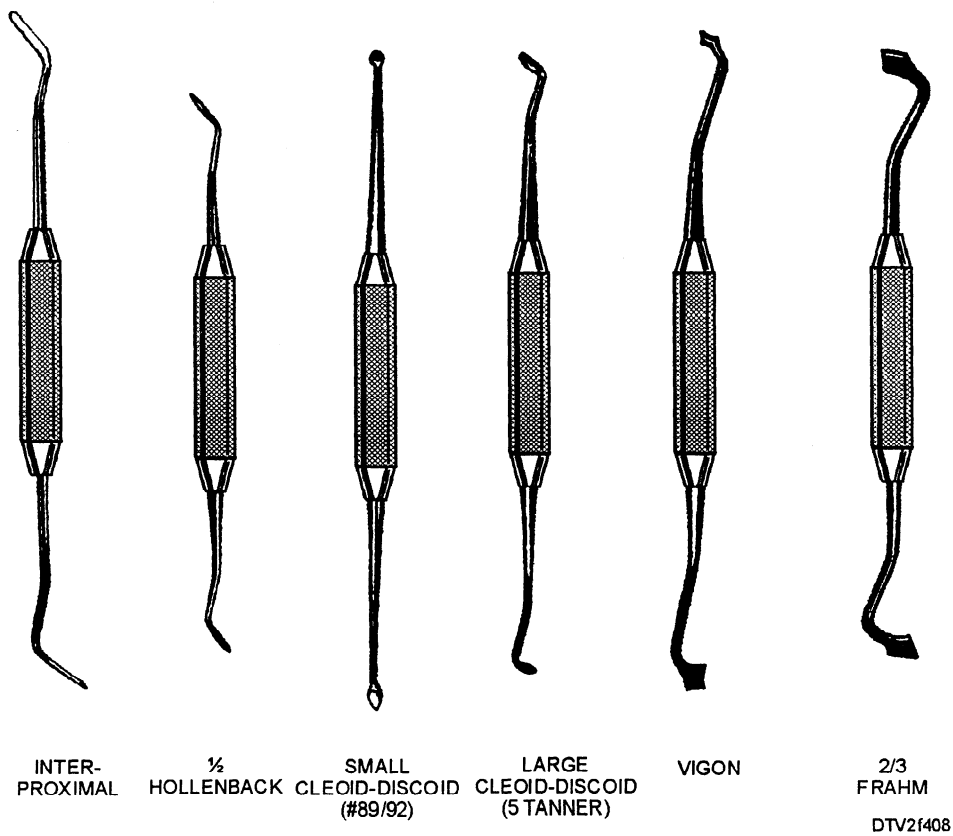


Figure 4-8.—Carvers.

working ends and come in single- and double-ended types. Some of the more commonly used burnishers are shown in figure 4-9.

COMPOSITE RESIN INSTRUMENTS

A variety of double-ended instruments make up this instrument group. They are used to transport and place dental cements, resins, temporaries, and insulating and pulp-capping materials. The working ends on composite resin instruments range from varying small cylinders to assorted angled, paddle-like shapes. Figure 4-10 illustrates the Woodson #3, #W3, and #11 (also know as Stellite), which are some of the commonly used instruments in this category.

Other types of composite resin instruments are made of plastic. Plastic instruments can be heat sterilized and used on composites and cements. They either come included in the kit of resin material from the manufacturer or, in some cases, can be ordered as a set as shown in figure 4-11. Some advantages to using plastic instruments are that they won't discolor or contaminate the composite restoration, and composite resin material will not cling to the instrument.

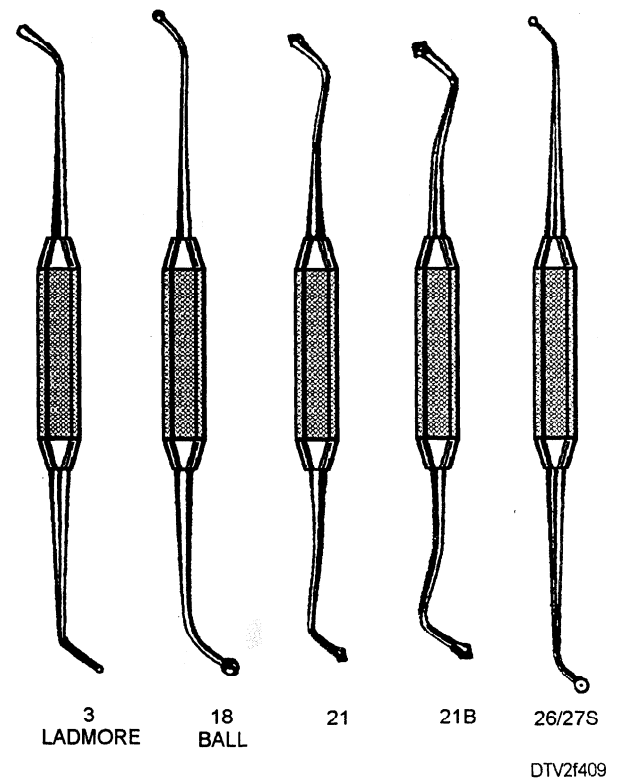


Figure 4-9.—Burnishers.

CEMENT AND INSULATING BASE INSTRUMENTS

The instruments in this group are used for mixing and handling restorative resin, and various temporary restorative, insulating, and pulp-capping materials.

Spatulas

Three different spatulas are available for mixing restorative materials, as shown in figure 4-13. Some of these spatulas can cause discoloration in the material being mixed. The selection of a mixing spatula is not critical **except** when preparing a permanent anterior composite restoration. Some composite restoration material discolors easily, so use the spatulas provided by the manufacturer when working with it. The single-ended #322 and #324 are suitable for mixing other materials other than composites. A smaller version for the #324 is the #313 spatula. The #313 is used for mixing small quantities of cement.

Insulating Base Instruments

Insulating base instruments have a small metal ball at the working end and are often referred to as calcium hydroxide instruments. They are used to mix, carry, and place insulating bases, and are available as a

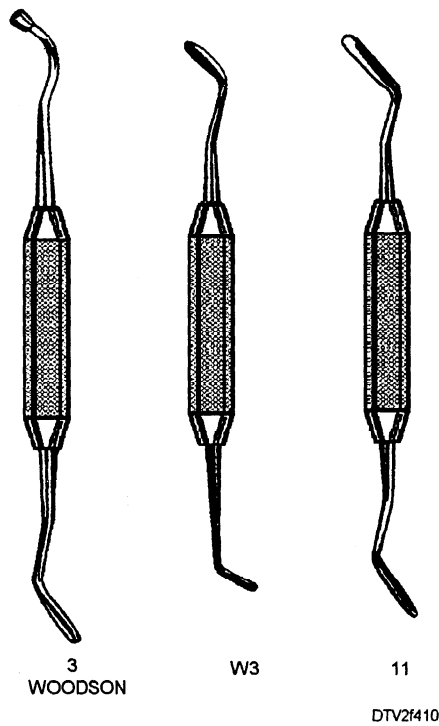


Figure 4-10.—Composite and cement instruments.

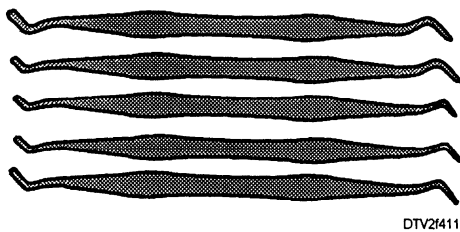


Figure 4-11.—Plastic composite instrument set.

Another instrument frequently used with etching and bonding procedures associated with composite resins is a disposable brush with a reusable handle. An example is shown in figure 4-12. Single-use disposal brushes are being used more frequently, aiding in good infection control practices.

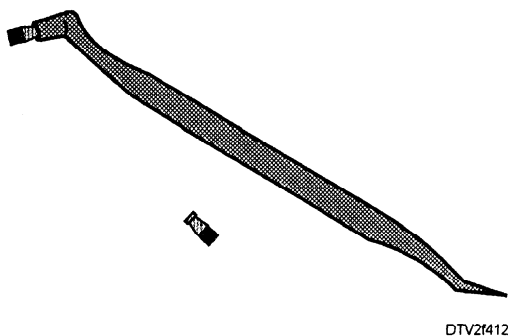


Figure 4-12.—Disposable brush and handle.

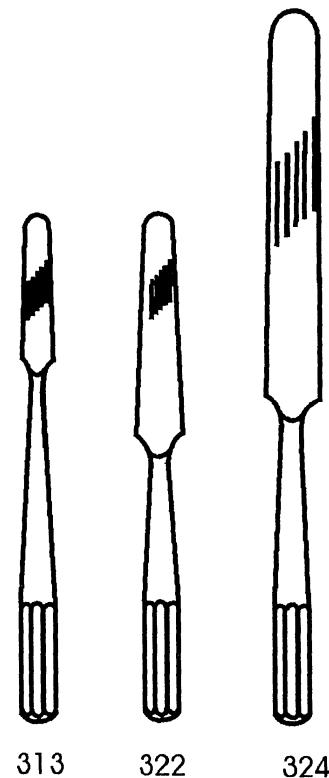


Figure 4-13.—Spatulas.

single-ended instrument or as a double-ended instrument, shown in figure 4-14.

MISCELLANEOUS INSTRUMENTS, MATERIALS, AND EQUIPMENT

A number of miscellaneous instruments, materials, and equipment are used in operative dentistry. Instruments such as dental mirrors, explorers, and cotton forceps are called a basic dental set (BDS) and are usually used in all dental specialties.

ASPIRATING SYRINGE

This syringe is used in dentistry to inject a local anesthetic. The aspirating syringe differs from most syringes in that it is designed to inject anesthetic from a carpule (fig. 4-15). The parts of an aspirating syringe consist of a threaded tip where the needle attaches, a barrel where the carpule is placed, a piston rod (plunger) with a harpoon attached that embeds itself into the rubber stopper of the carpule, a finger grip, and a thumb ring (fig 4-16). The harpoon allows the dentist to aspirate (draw back) the injection site to see if the needle tip is located in a blood vessel before injecting the anesthetic solution. Once the harpoon is engaged into the rubber stopper of the anesthetic carpule, the dentist can apply inward or outward pressure on the



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Figure 4-14.—Double-ended calcium hydroxide instrument.



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Figure 4-15.—Anesthetic carpule.

stopper by exerting pressure on the thumb ring. Pulling the thumb ring outward also pulls the plunger outward producing an aspirating effect; whereas, pushing inward forces the anesthetic solution through the needle.

ASPIRATING SYRINGE NEEDLE

The aspirating syringe needles used in dental treatment arrive sterile and are disposable. They are designed for a single use, and are available in different gauges and lengths (fig. 4-17). The gauge of a needle refers to the diameter of the hollow shaft of the needle. The larger the gauge, the smaller in diameter the needle. The lengths of the needles vary, and are classified as long (L) or short (S).

Each needle has either a plastic or metal hub designed to screw onto the threaded end of the syringe (fig. 4-18). This hub is positioned to permit the needle to extend inward to penetrate the rubber seal portion of a loaded anesthetic carpule.

The plastic caps covering the sterile needle are easily removed from both ends. When placing the needle onto the syringe, remove only the cap that covers the syringe end on the needle. This maintains the sterility of the needle portion used to inject the patient.

Normally, you prepare the anesthetic syringe with a short needle (13/16 inch in length) for maxillary injections, and a long needle (17/8 inches in length) for mandibular injections. The tip of the needle has a beveled angle, which is turned toward the alveolus to accurately deposit the solution.

RUBBER DAM INSTRUMENTS

Rubber dam instruments include the rubber dam punch, clamps, clamp forceps, and frame. These instruments prepare and maintain the position of thin sheets of latex rubber (rubber dam material). The rubber dam itself is used to isolate a designated tooth or teeth in the mouth before certain operative, endodontic and preventive dentistry procedures are performed. The rubber dam provides a clean, dry field of operation and improves the dentist's view of the operating site. It also keeps fluids, tissues, and the tongue away from the operating site and prevents the patient from accidentally swallowing or aspirating debris.

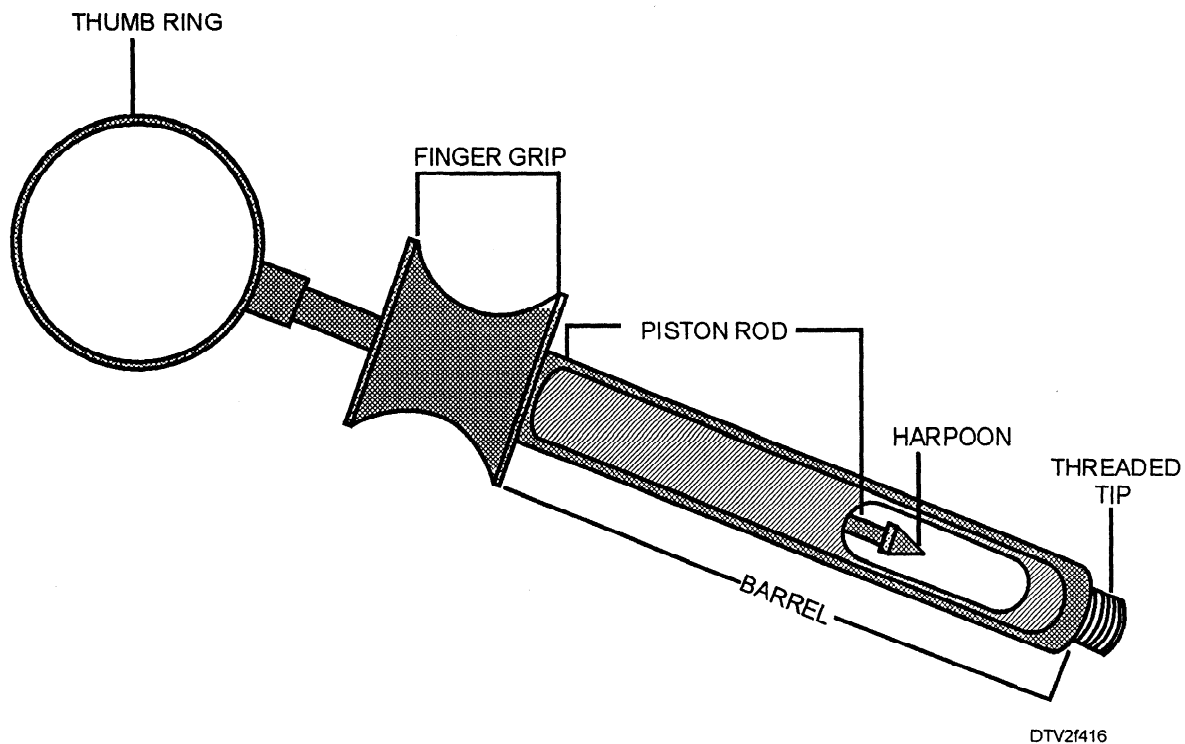


Figure 4-16.—Parts of an aspirating syringe.

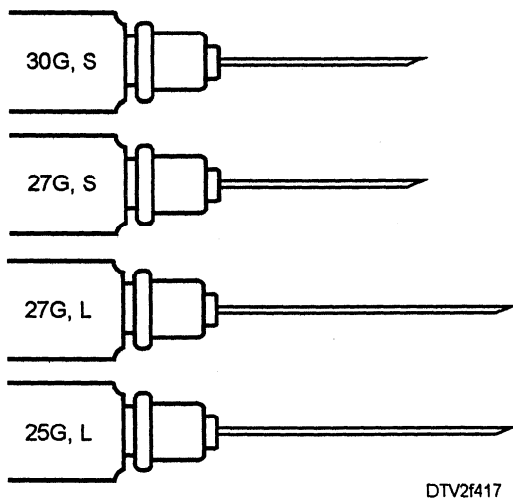


Figure 4-17.—Different gauges and lengths of aspirating syringe needles.

Rubber Dam Punch

The rubber dam punch is used to make necessary spaced holes in the rubber dam material. The working end is designed with a plunger on one side and a wheel on the other side (fig. 4-19). This wheel has different sized holes on the flat surface facing the plunger. These features let the operator select and adjust the

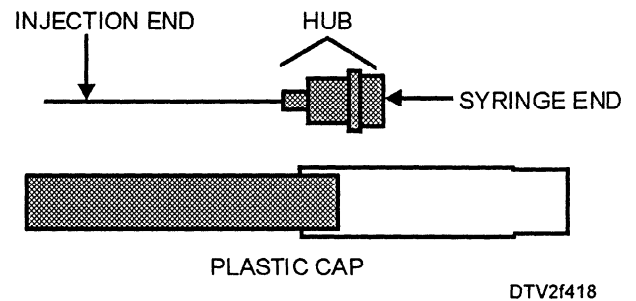


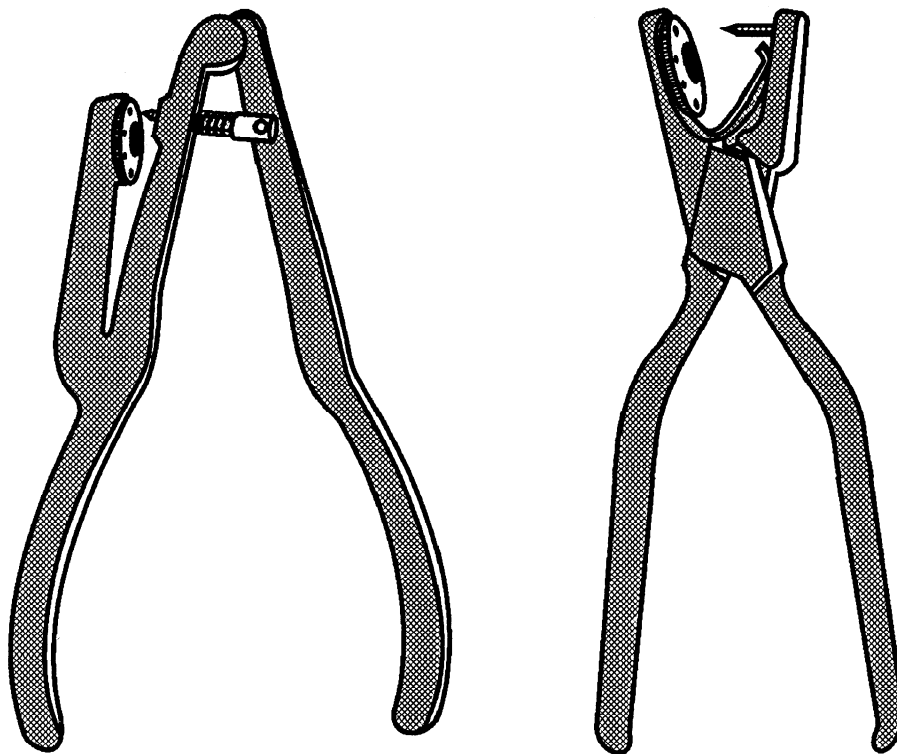
Figure 4-18.—Parts of the aspirating syringe needle.

wheel to punch the desired diameter hole in the rubber dam.

Figure 4-19 also illustrates the recommended holes on the wheel to use. The largest hole is used on the tooth that your clamp will go on. The last five remaining holes correspond to the teeth that are included in the isolation.

Rubber Dam Clamps

After the required number of holes are punched in the rubber dam, it is stretched to fit over each designed tooth. To maintain a snug fit around the neck of the

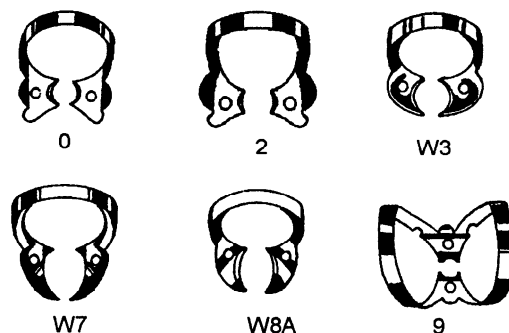


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Figure 4-19.—Two styles of rubber dam punches.

tooth, a rubber dam clamp is used. These clamps are made of spring steel in various sizes (fig. 4-20) to fit the general contours of the different teeth. You will need to know some of the commonly used clamps and their area of use, which are shown in table 4-1.

Clamps commonly used in pediatric dentistry include the #2, #4, #8A, and #14A. Clamps with "W" prefixes, such as the #W8A or W3, indicate that the clamps are **without wings** on the outer portions opposite the holes.



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Table 4-1.—Commonly Used Rubber Dam Clamps and Their Area of Use

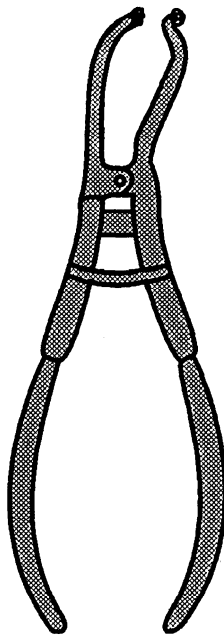
Clamp #	Area of use in the mouth
0	Primary teeth
2	Small bicuspid
W3	Bicuspid and small molars
7	Mandibular molars
W8A	Partially erupted molars
9	Anterior teeth
2 1 2	Anterior teeth

Figure 4-20.—Rubber dam clamps.

The space between the gripping edges of the clamp is narrower than the diameter of the corresponding tooth. Thus, to place the clamp around the tooth, it is necessary to spread the gripping edges wider than the tooth's diameter. To spread the gripping edges, rubber dam clamp forceps are used.

Rubber Dam Forceps

The rubber dam clamp forceps (fig. 4-21) are designed to spread the two working ends of the forceps apart when the handles are squeezed together. The



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Figure 4-21.—Rubber dam clamp forceps.

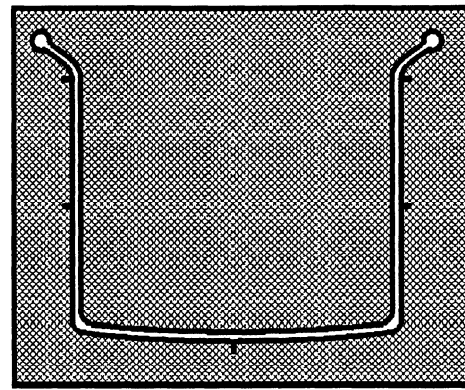
working ends have small projections that fit into two corresponding holes on the rubber dam clamps. The area between the working end and the handle has a sliding lock device. This sliding lock device locks the handles in positions while the provider moves the rubber dam clamp around the tooth.

Rubber Dam Frame

To place and clamp a rubber dam around the tooth is not enough. The dentist still needs something to hold the loose outer edges of the rubber dam sheet so that the area is visible, and provides access to the tooth being treated. The need is met with an instrument called the rubber dam frame. Most of the rubber dam frames used today are U-shaped. One of the most popular is the Young frame, which is available in adult (fig. 4-22) and pediatric sizes. When the edges of the rubber dam are connected to the small, sharp projections on this U-frame, there is adequate access to, and visibility of the area of treatment.

RUBBER DAM APPLICATION

The use of the rubber dam is an important part of quality dental treatment and infection control. To save valuable chairside time, place the rubber dam following the administration of local anesthetic (as directed by the dentist). To place the rubber dam, you



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Figure 4-22.—Adult rubber dam frame.

will need the rubber dam material, frame, punch, clamps, and clamp forceps.

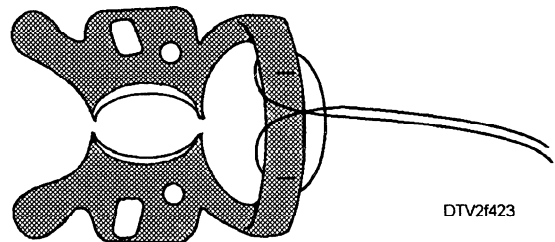
Preparation

The first step in applying the rubber dam is to check the contact areas of the teeth to be isolated. Use a piece of dental floss to do this. The next step is to determine which tooth the rubber dam clamp will be placed upon. Once this is determined, select a rubber dam clamp for a trial placement.

CAUTION

To prevent the patient from aspirating or swallowing the rubber dam clamp, always tie dental floss (ligature) on the bow of the clamp before placing it in the patient's mouth.

A simple and secure method is put both ends of a piece of floss together and place them on a flat surface. This forms a looped end where the floss is folded in half. Place the clamp over the floss with the bow of the clamp facing up. Now, place the two loose ends through the looped end and carefully pull the loose ends through the loop until the floss is secured tightly over the bow of the clamp (fig. 4-23). You should now



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Figure 4-23.—Ligature on rubber dam clamp.

have a securely placed ligature on the clamp. You are now ready to place the clamp on the rubber dam forceps.

Hold the clamp with the bow facing upward and away from the forceps. Place the small projections on the working ends of the rubber dam forceps into the corresponding holes on the rubber dam clamp. Squeeze the handles of the forceps together to align projections with the corresponding holes on the clamp. Once the clamp is placed on the forceps, tilt the forceps upright and slide the locking device on the forceps downward to lock the handles in position. Locking the forceps handles is necessary to continue the tension required to keep the clamp attached to the forceps. Now the clamp is ready for trial placement.

Pass the rubber dam forceps, with the working end covered, with the palm of your hand and the clamp pointed toward the placement position of the tooth. Be sure to hold on to the ligature while the clamp is checked for proper fitting. Normally, the clamp should fit near or slightly below the cemento-enamel junction. To stabilize the clamp, all the tips of the clamp must be in contact with the tooth to establish a facial lingual balance. Exercise care to ensure that the clamp tips do not impinge on the gingival tissues. If it does, it will cause the patient to experience pain. If the clamp is not placed properly, it may spring off the tooth and cause injury. Caution is advised to stabilize the clamp firmly on the tooth before the clamp forceps are loosened. Once the trial placement is complete, remove the forceps and attach the clamp until final placement.

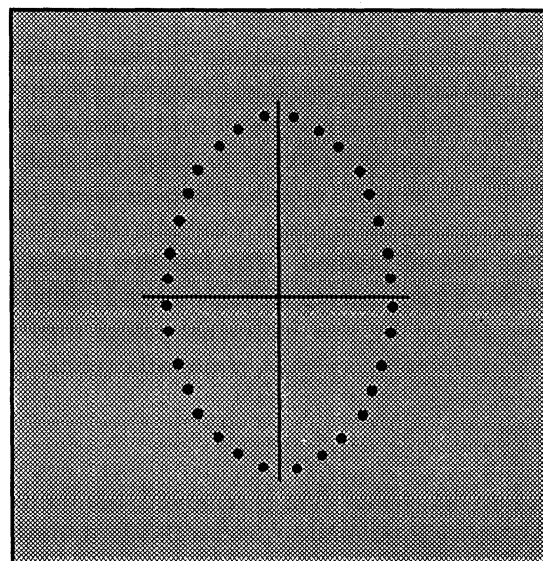
To prepare the rubber dam material, you need the rubber dam punch to make the appropriate number of holes of varying sizes. The punch has an adjustable wheel with holes of varying sizes. By adjusting the wheel, holes of different sizes are produced in the material when the cutting tip strikes the hole in the wheel. The holes in the rubber dam material must be punched firmly and cleanly. A ragged hole or tag will tear easily as the dam is placed over the crowns of the teeth. A 'ragged hole also may cause leakage of moisture around the tooth.

Ideally, the rubber dam material is marked (fig. 4-24) with predetermined markings of an average arch using a rubber dam stamp and ink pad. This makes punching the rubber dam material easier because you have a pattern to follow with the normal shape of the arch and spacing alignment of the teeth. Before punching the material, always check the oral cavity for any missing, misaligned, or extra teeth. You will need to make adjustments from the standard pattern for

these items. Punch the hole for the tooth to be treated first. Then, determine what additional holes must be punched. Normally, you will punch holes for the two anterior and at least one tooth posterior to the tooth being treated. An **exception** to this is root canal therapy when only the involved tooth is exposed. After the holes are punched, apply a slight amount of water soluble (brushless shaving cream) lubricant to the back of the material over the crowns and contact areas of the exposed teeth. Now the rubber dam is ready for placement into the oral cavity.

Placement

The rubber dam material and clamp can be placed using several methods. The first method usually requires assistance. Place the rubber dam frame on the outside of the dam with the bow of the frame facing out. Stretch the dam material from side to side to secure the corners of the dam on the four projections at the corner of the frame. The rubber dam material should appear baggy on the frame rather than tight to allow easier placement in the oral cavity. Pass the rubber dam and attached frame to the dentist for placement in the oral cavity. As the dentist stretches the rubber dam material over each tooth to be isolated, the assistant uses floss to slip the septum (rubber dam material between the holes) between the teeth without tearing the material. Always place the floss on the tooth, never directly on the rubber dam itself. Placement of the floss upon the tooth assists in bringing a single thickness of the dam through the



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Figure 4-24.—Marked rubber dam material.

proximal contact when the floss is carried through. Floss placed on the rubber dam itself tears the dam and requires the passing of two thicknesses of the dam through the contact. Once the floss passes the contact of the teeth, release the lingual end of the floss. Loop this end toward the opposite end and floss through the contact again. Now, gently remove the floss by pulling it from the side horizontally, rather than attempting to pull the floss back up through the contact vertically. Continue using the floss to invert the inter-proximal septum, mesially and distally as well. Inversion of the rubber dam turns the edges of the dam inward or under, around the isolated teeth, to provide a seal. After this is completed, pass the rubber dam clamp forceps and attached clamp to the dentist for final placement on the tooth. Adjustment of the rubber dam material on the frame can be made at this time to ensure a smooth and stable fit. Wrap the ligature attached to the clamp around a projection on the side of the frame. This prevents the clamp from becoming a dangerous projectile if it should spring off the tooth. Pass a dull instrument, such as a stellite instrument, to the provider for inversion of the rubber dam on the facial and lingual areas of the exposed teeth. Dry the exposed teeth with air from the three-way syringe as needed to assist in the inversion.

The second method places the rubber dam clamp on the tooth first. Then slip the rubber dam material over the clamp. Next, in either order, attach the frame and expose the remaining teeth through the holes. Secure the clamp ligature to the frame. Then invert the mesial and distal septum with floss, and the facial and lingual areas with a dull instrument accompanied with air from the three-way syringe.

In the third method, the clamp is held in the rubber dam forceps and the rubber dam placed over the bow of the clamp. Holding the edges of the rubber dam with your fingers, use the forceps to carry the dam and clamp into the patient's mouth. Place the clamp on the tooth and remove the forceps. Continue the placement as in the second method. The last two methods of rubber dam placement are valuable when a rubber dam must be placed by one individual rather than two. After the restoration is placed, remove the rubber dam.

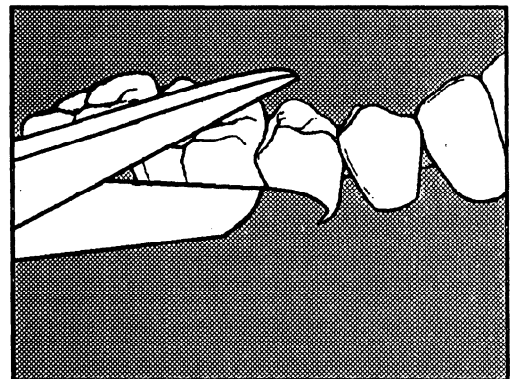
Removal

Before the rubber dam is removed, use the water syringe and high-volume evacuator (HVE) to flush out all debris that collected during the procedure. Rather than pulling the septa through the contact of a newly placed restoration, the septa is cut. Stretch the rubber

dam material outward in the facial area of the isolated teeth. This pulls the septa facially to provide access for cutting. Use a pair of small blunt-nose scissors to cut each septum of the rubber dam from the facial aspect (fig. 4-25). When all the septa are cut, gently pull the dam lingually to free the rubber dam completely from the interproximal spaces. Use the clamp forceps to remove the clamp. Simultaneously, remove the clamp ligature from the frame. Set the clamp forceps and clamp aside. Now, remove the dam with the frame attached. Wipe the patient's mouth, lips, and chin with a tissue or gauze. Carefully inspect the dam on a flat surface for missing pieces. If a fragment of the rubber dam is missing, check the corresponding interproximal area of the oral cavity with a mirror and explorer. Pieces of the rubber dam left under the free gingiva cause severe gingival irritation. Use dental floss to remove any material stuck between the teeth. Rinse the patient's mouth with the water syringe and HVE to remove all debris from the oral cavity.

MATRIX RETAINERS

Matrix retainers are used to hold the matrices (metal bands or strips) firmly in place around a tooth. Matrix retainers and metal bands are used in combination for a temporary mold while the filling material is being packed into place. The Tofflemire retainer (or matrix retainer) is available in three different designs: the universal straight, contra-angle, and contra-angle junior (pedodontic) shown in figure 4-26. These retainers are practically maintenance free. They can be heat sterilized along with other dental instruments. Your part in maintaining matrix retainers is to check them periodically and replace those with badly worn screw threads. You are also expected to attach the correct matrix band to the appropriate retainer in anticipation of the dentist's needs.



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Figure 4-25.—Cutting rubber dam septum.

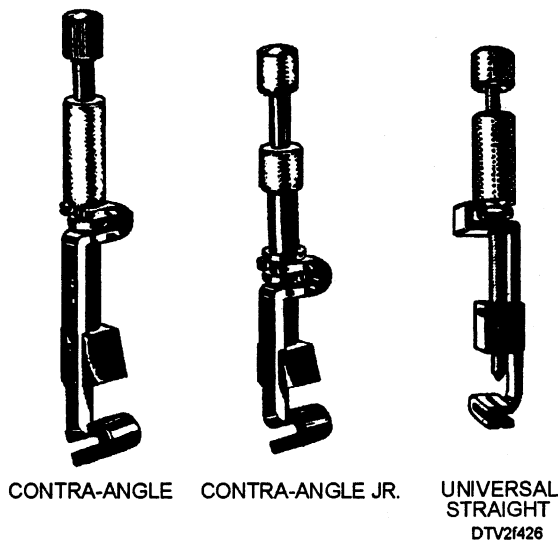


Figure 4-26.—Matrix retainers.

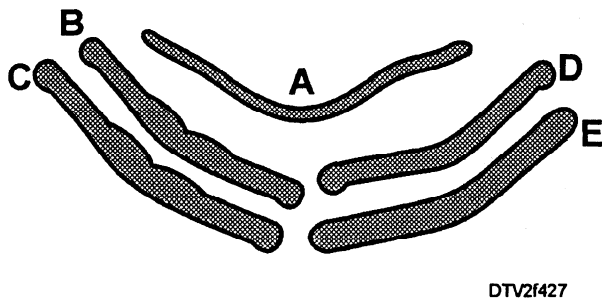


Figure 4-27.—Amalgam matrix bands. A: Precontoured. B: Junior (Pedodontic #15 with aprons). C: Wide #2 with aprons. D: Junior #13 (Pedodontic). E: Universal #1.

Amalgam Matrices

Amalgam matrices are made of very thin flexible stainless steel available in either roll form or in bands. At times, the standard packaged matrix bands do not

provide the necessary length, width, or shape for a particular cavity preparation. When this is the case, the dentist can cut the metal matrix strips to form the needed band. Bands used with the Tofflemire retainers completely encircle the tooth. Matrix bands come in assorted sizes and shapes, as shown in figure 4-27. The **most commonly** used band is the Universal or Straight #1 size. The Junior #13 is the smaller pedodontic version of the #1 Universal. The Wide #2 and Junior #15, (which have extensions known as “aprons”) are used when additional length is needed for a preparation extending below the gingiva. A dentist usually prefers certain types of these bands over others. With practice, you should become very proficient in having the preferred band on the appropriate retainer.

ASSEMBLING MATRICES

When multiple surfaces of the tooth are removed during the cavity preparation, a matrix is used to approximate the original surface and hold the restorative material in proper form and position until it sets. The type of matrices used depends on the type of restorative material placed. You will need to have the right type of matrix available and assembled ready for use during the procedure.

Amalgam matrices are made of very thin, flexible stainless steel available in either roll form or bands. The matrix band, retainer, and wedge are used in combination to form a temporary mold while the filling material is being packed.

The matrix is assembled and placed before the amalgam is mixed. After the amalgam has been packed, the matrix and wedge must be removed before the final carving can be accomplished.

The most commonly used retainer is the universal straight Tofflemire. Its components are shown in figure 4-28.

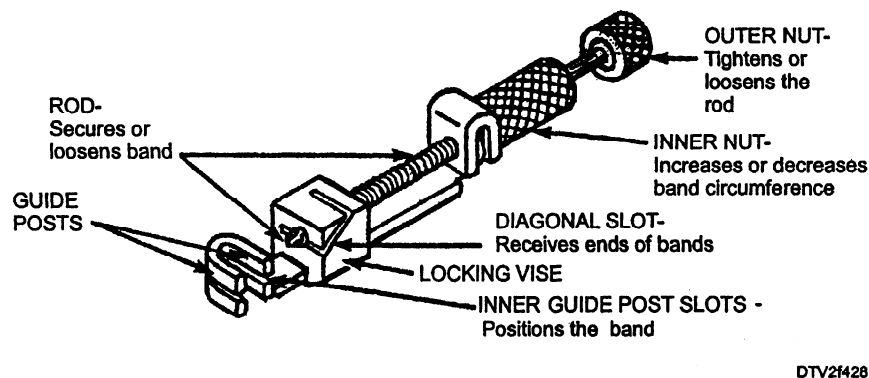


Figure 4-28.—Components of the matrix retainer.

To assemble the matrix, hold the retainer in one hand with the slots in the guide posts and locking vise facing upward. Turn the large inner nut counterclockwise to position the locking vise close to the guide post. Turn the small outer nut counterclockwise until the rod is not visible in the locking vise slot. In your other hand, grasp the band with the ends placed evenly together. Place the edge of the band with the larger circumference (occlusal edge) into the diagonal slot at the vise end of the retainer. With the band placed in this manner, the larger circumference is toward the occlusal surface and the smaller circumference toward the gingiva, as shown in figure 4-29. Continue to ease the band through the inner guide post slot. As figure 4-30 shows, position the band through the left guide post for teeth on the mandibular right or maxillary left quadrants. For teeth in the mandibular left or maxillary right quadrants, position the band through the right guide posts. Turn the outer nut clockwise until the rod tip presses firmly against the band in the lock vise to secure the band. Turn the inner nut counterclockwise to increase the size.

When the assembled matrix is placed over the prepared tooth, the slot opening of the retainer and the small circumference of the band are positioned toward

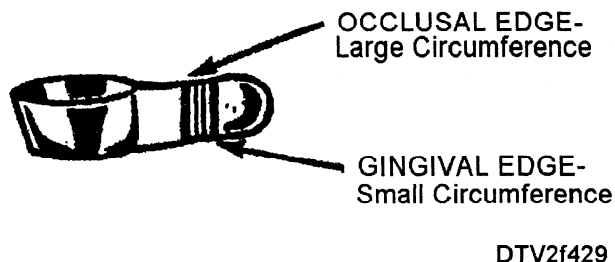


Figure 4-29.—Large and small circumferences of the band.

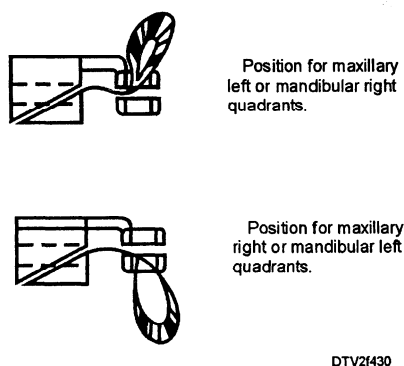


Figure 4-30.—Positioning the band to the right or left for the appropriate quadrants.

the gingiva, and the retainer is placed along the facial surface of the tooth. The handle of the retainer extends out of the oral cavity at the corner of the lips. The dentist gently manipulates the matrix band into the inter-proximal space on either side of the tooth. The dentist then places an index finger or thumb over the occlusal surface to hold the band in place and tightens the band by turning the inner nut clockwise to fit snugly around the tooth. At this time, the dentist may decide to place a wedge along the side of the matrix band.

Wedges

Wedges are small, tapering, triangular pieces of wood or clear plastic about 1/2 inch in length. Wedges are available in various sizes, which may be color coded. They are either plain (straight) or anatomically shaped (fig. 4-31). Clear plastic anatomical wedges are designed for use with light-cured materials.

Since the general shape of tooth crowns varies, the matrix band around the tooth may not always produce a snug fit. This leaves space through which condensed restorative material can be pushed out to create an undesirable overhanging restoration. The dentist uses wedges to force the matrix band or strip tightly against irregular tooth surfaces to prevent these spaces. This snug fit then restricts the firmly condensed restorative material to the confines of the prepared cavity margins and the band itself.

Matrix Removal

Because new restorations fracture easily, use extreme care when removing the matrix band. To remove the matrix band and retainer, the dentist, first

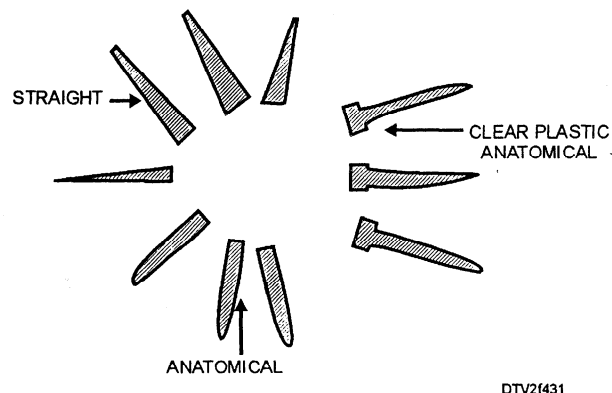


Figure 4-31.—Wedges.

gently manipulates the point of an explorer around the inside edge of the band. This contours the marginal ridge of the restoration and removes the excess amalgam around the matrix band. The assistant will pass the dentist hemostats or cotton forceps to remove the wedge if one was placed. With the thumb or finger over the occlusal surface of the restoration and matrix band, the outer and inner nuts are turned counterclockwise to loosen the retainer from the band. After the retainer is removed, the remaining band is carefully removed. A loose end of the band is grasped with the hemostats or cotton forceps and gently rocked back and forth until the band comes out of the interproximal space. Remove the band from the other interproximal space in the same manner.

PIN AMALGAM SET

Extensive decay or a cusp fracture results in the loss of a major portion of the tooth structure. To restore such a tooth to its former healthy condition, the dentist may choose to rebuild the tooth. If the tooth is a posterior one, the dentist may use the pin amalgam technique. For a pin amalgam restoration, the dentist uses specific instruments. The pin amalgam instruments are packaged in kits in which pin burs (drills), self-threading pins, and pin (hand) wrenches are precision matched. It is extremely important to keep the set together since there are a large variety of types and sizes. The pins are placed with a hand wrench in the tooth preparation to anchor the amalgam or restorative material in place (fig 4-32). A **pin bender** is frequently used to bend or slightly adjust the position of inserted pins. Follow the manufacturer's instructions before handling these materials.

FOUR-HANDED DENTISTRY

The goal of four-handed dentistry is to allow the dentist and assistant to function as a team in a seated

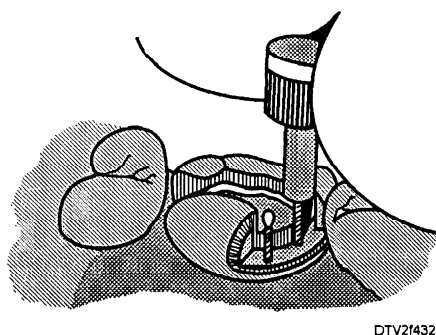


Figure 4-32.—Using a hand wrench to place pins in a tooth preparation.

position with maximal efficiency and minimal strain. Four-handed dentistry, as it has been developed, not only increases productivity, but also reduces stress and fatigue on the provider and assistant. Four-handed dentistry can be used in all of the specialty areas, and in operative dentistry. It is discussed here because instrument exchanges in operative dentistry require you to perfect this task. To be an effective dental assistant in four-handed dentistry, you must know the correct zones and positions that you are in and where you are in relation to the patient and dentist. Also correct passing and receiving of instruments and materials to the dentist is a task that must be practiced to work efficiently with the dentist.

ZONES AND POSITIONS

The position of the patient is determined by the procedure to be performed. Most dental treatment is provided with the patient in the supine position. Once the patient has been seated, the dentist and the assistant should place themselves in the proper positions for treatment. These positions are best understood by relating them to a clock. In the clock concept, an imaginary circle is placed over the dental chair, with the patient's head at the center of the circle. The circle is numbered like a clock with the top of the circle at 12 o'clock. The clock, as shown in figure 4-33, is divided into four zones of operation:

- Static zone
- Assistant's zone
- Transfer zone
- Operator's zone

The use of these zones is the key to the efficient implementation of the principles of four-handed dentistry. For right-handed dentists, seated to the right of the patient, the **operator's zone** is between 8 and 11 o'clock, and the **assistant's zone** is between 2

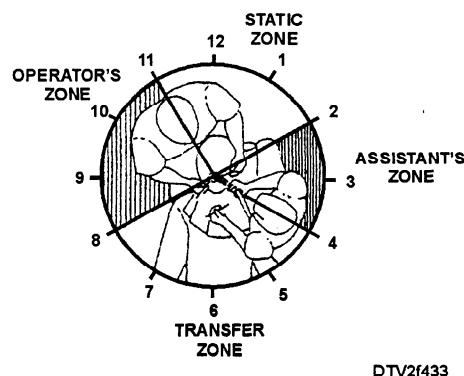


Figure 4-33.—Zones of operation for four-handed dentistry.

and 4 o'clock. For left-handed dentists, seated to the right of the patient, the **operator's zone** is between 1 and 4 o'clock position and the **assistant's zone** between 8 and 10 o'clock. Whenever the treatment site is on the lingual surfaces of anterior teeth, the dentist (right or left-handed) generally uses the 12 o'clock position.

The **transfer zone** is from 4 to 8 o'clock. Instruments and materials are passed and received in this zone over the chest and at the chin of the patient. All instruments and materials are located in the assistant's zone.

The **static zone**, from 11 to 2 o'clock, is a non-traffic area where equipment, such as nitrous oxide, can be placed with the top extending into the assistant's zone. When an object is heavy, or material or an instrument is objectionable if held near the patient's face, you may pass or hold it in the static zone. As an example, anesthetic syringes are sometimes passed to the dentist in this area so that the patient will not be alarmed at the sight of the syringe. Part of this area can also be used when the provider is positioned in the 12 o'clock position as previously mentioned.

Dentists and dental assistants should sit with their back straight and head relatively erect. This helps prevent curvature of the spine. The patient should be lowered to a position that places the treatment site as close to the dentist's elbow level as possible. When the patient is properly positioned, the dentist's eyes should be 14 to 16 inches from the treatment site.

As the assistant, you should sit as close as possible to the back of the patient's chair with your feet directed toward the head of the chair. This position lets you reach the treatment site, hose-attached instruments, and instruments and materials from the mobile cart or instrument tray without leaning, twisting, or overextending your arms. In this position you are also able to observe the patient's responses throughout the procedure. Adjust your stool so that your eye level is 4 to 6 inches above the dentist's eye level. Like the dentist, the assistant should sit in an erect position. The assistant's chair may have a curved, movable armrest. This armrest may be adjusted in front to support the body just below the rib cage. Using this armrest as a brace, you are able to lean slightly forward from the hips only. Place your feet firmly on the foot-support ring at the base of the assistant chair so that your feet are parallel to the floor. The mobile cart or instrument tray should be placed toward the head of the patient's chair, and positioned to allow you easy access to the needed instruments and materials.

PASSING AND RECEIVING INSTRUMENTS AND MATERIALS

To increase production while reducing stress and fatigue of the dentist and the assistant, you and the dentist will need to work together as a team. You must be able to anticipate the dentist's needs and fulfill those needs without unnecessary delay. To accomplish this, you must know the sequence of the treatment procedure and have the required instruments and materials ready at the proper time. When you assist in four-handed dentistry, you must also irrigate with air and water as well as aspirate with the high-volume evacuator throughout the procedure. To enable you to pass and receive items efficiently during the procedure, we will begin with instrument transfers.

Instrument Exchange

Instrument exchange between the dentist and assistant takes place in the transfer zone near the patient's chin. As the assistant, you must anticipate the dentist's needs, and be ready when signaled by the dentist to pass the next instrument and receive the used one in a smooth motion. An alert assistant does not need a verbal command to make the exchange, but should be constantly ready when the exchange signal occurs. Ideally, the instrument transfer is accomplished with a minimum of motion involving movement **only of your fingers, wrist, and elbow**. During the transfer, the dentist should **not** move the finger rest or eyes from the treatment site. When the exchange is completed, the dentist pivots the working hand back to the working position.

You should arrange the instrument setup in an orderly fashion. Usually the instruments are set up from left to right, in the sequence in which they are to be used. You should return them to their original position following use in case they need to be reused.

Let's assume that you are assisting a right-handed dentist and, therefore, are seated on the left side of a patient. Since your right hand is busy aspirating, you must learn to transfer instruments with your left hand. The one-hand instrument exchange is discussed next.

ONE-HAND INSTRUMENT EXCHANGE.—

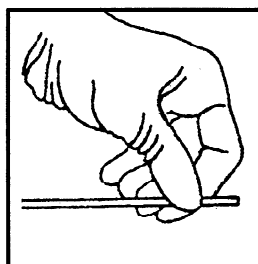
The actual instrument transfer is divided into four **stages—working, signal, pre-transfer, and mid-transfer**.

In the working stage, pick up the next instrument to be used from the instrument tray with your left

hand. Grasp the instrument between your thumb and first two fingers by the end opposite from the working end as shown in figure 4-34 (step A). Hold the working instrument close to the treatment area and parallel to the instrument being used. Extend your little finger to receive the instrument being used by the dentist as shown in figure 4-34 (step B).

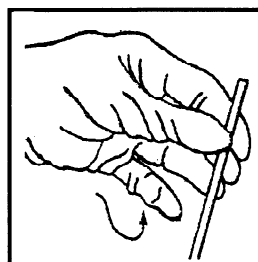
The signal stage takes place when the dentist signals for the next instrument by slightly raising the instrument from the tooth. During this stage, the dentist maintains his/her fulcrum (finger rest) and, with a pivotal action, rotates the working hand away from the patient's oral cavity. This positions the used instrument so that you can grasp it with your little finger.

STEPS



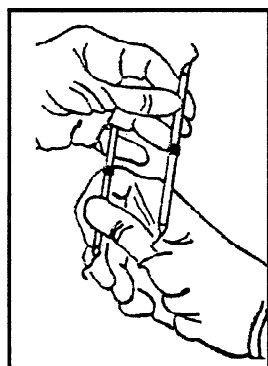
Hold instrument opposite the working end.

A



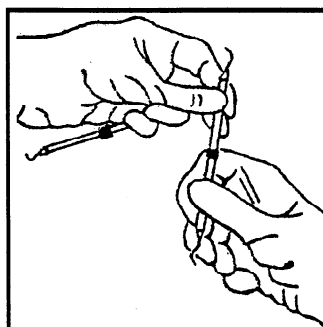
Hold instrument with thumb, index and ring fingers ready to pass. Prepare to receive used instrument with little finger extended.

B



Passing position

C



New instrument placed in dentist's hand with working end pointed towards working site. Used instrument pulled toward assistant's hand.

D

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Figure 4-34.—Instrument exchange (steps A through D).

In the pre-transfer stage, grasp the used instrument firmly using the little finger as shown in figure 4-34 (step C). Sometimes, you may prefer to use the last two or even three fingers to receive the used instruments. Immediately following this action, you carry out the mid-transfer stage.

In this stage, place the next instrument into the dentist's hand with the working end positioned toward the treatment site, as shown in figure 4-34 (step D). When the treatment site is located on the maxillary arch, point the working end of the instrument **up**. Likewise, when the treatment site is on the mandibular arch, position the working end **down**. Do not release your grip of the new instrument until the dentist has firmly grasped the instrument. If the instruments become tangled during the exchange, this is usually caused by failure to parallel the handles before the exchange. The exchange of all instruments is done with firm, deliberate movements to give both the dentist and the assistant the feeling of confidence and to eliminate lost time and motion. Return the used instrument to its original position on the instrument tray and prepare to repeat the procedure with the next instrument required.

Refer to figure 4-35 for an overhead view (left-handed) of an instrument exchange during patient treatment. When you assist from the right side of the

patient, use your **right hand** in the same manner described for the left hand.

OTHER INSTRUMENT EXCHANGE TECHNIQUES.—Other instrument exchange techniques may have to be used depending on what type of instrument is being exchanged. These other techniques have been described in "Oral Surgery Assistance," Volume 2, chapter 5.

Handpiece and Bur Exchange

The dental handpiece can be exchanged for another instrument in the same manner described in this section. If two handpieces are exchanged, exercise caution to avoid tangling the hoses during the exchange.

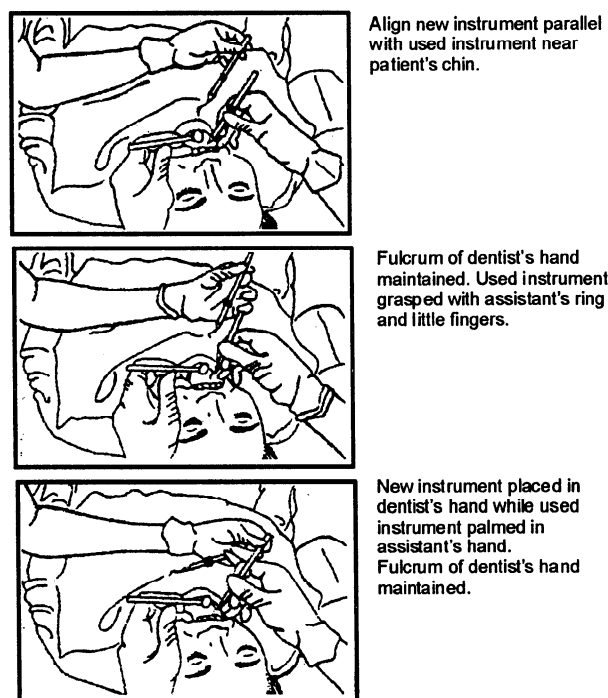
During the operative procedure, the dentist holds the handpiece firmly over the patient's upper chest in the transfer zone, and then the assistant will loosen and remove the bur. The assistant next retrieves the bur that was selected by the dentist and places it into the dental handpiece and secures it. Always give the bur a gentle tug to ensure that it is firmly seated in the handpiece. If the dentist uses a different instrument between bur exchanges, change the bur outside the transfer zone, usually over the tray setup.

If the dentist changes handpieces and requires an exchange of burs in the returned handpiece, be sure to use the lock-out toggle switch for the handpiece before attempting to change burs. If you fail to do this, you could cause harm to yourself when the provider steps on the foot control to activate the other handpiece.

Preparing and Passing Materials

Dental materials are exchanged at the patient's chin in the transfer zone. This prevents materials from being dropped on the patient's face. Small amounts of dental materials may be mixed and passed on a glass slab, paper pad, or dappen dish.

As a dental assistant, you must prepare dental materials at the proper time during the procedure. A material mixed too soon does not allow sufficient handling time. Knowing when to mix is equally as important as knowing how to mix. As with instruments, knowing the routine of the procedure lets you anticipate when the dentist will need the specific material. You should have the mixing equipment ready and the material in position and in place slightly before the time it is needed. Begin mixing only when you know the dentist is ready.



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Figure 4-35.—Overhead view of instrument exchange.

When you are assisting during an amalgam restoration, load the amalgam into the carrier and pass the loaded carrier to the dentist. You may sometimes use two or more amalgam carriers, which lets you fill the barrel of one while the dentist is using the other. You must also add into this sequence of filling and refilling the amalgam carriers the passing of condensing instruments to the dentist during the amalgam restoration process.

During the use of cements, most dentists prefer that you leave the mixed cement on the glass slab or mixing pad and then hold the pad or slab in your hand near the treatment site. The dentist can select the amount desired. In your other hand, you can hold the air syringe to dry the area for application and placement of the material. With the use of some materials, you may need to hold a gauze sponge in your hand (rather than the air syringe) to wipe excess material from the application instrument.

The overall idea in passing and receiving dental instruments and materials is to have the needed item at the right place, in the right position, at the right time. In doing this, the dentist is then free to concentrate more on the area of treatment.

BASIC DENTAL PROCEDURES

Some basic dental procedures, such as administration of local anesthetic, irrigation, aspiration, and retracting of tissues, are performed in nearly all aspects of all clinical dentistry. Others such as rubber dam application and assembling of matrices are performed in operative procedures. Except for the administration of local anesthetic, you must be able to perform these procedures. When administration of local anesthetic is required, you need to prepare all the items used for this procedure.

LOCAL ANESTHETIC

Before doing a possibly painful dental procedure, the dentist will give the patient a local anesthetic to make the treatment site insensitive to pain. You must be knowledgeable of the various techniques used to prepare for the correct type of injection. These techniques such as topical, infiltration, and block injections have been discussed in Volume I, chapter 7, "Oral Pharmacology."

Pre-Injection Items

Before giving a local anesthetic, the dentist may use the following pre-injection items to prepare the injection site:

- Antiseptic solution
- 2 x 2 inch gauze sponges
- Cotton tip applicators
- Topical anesthetic

The dentist may have the patient use an antiseptic mouthwash to rinse the oral cavity before applying a topical anesthetic. The gauze sponges are used to dry the injection site mucosa before applying the topical anesthetic. The topical anesthetic, usually supplied in an ointment, is applied with a cotton tip applicator to reduce the pain associated with the injection of the needle.

Injection Items

The items used to give local anesthetics are an aspirating syringe, needle, and carpule. It is also important to know the different types of anesthetic and how to assemble and disassemble the aspirating syringe properly for the dentist's use.

You'll find many types of anesthetic carpules in Navy dentistry. As discussed in Volume I, chapter 7, "Oral Pharmacology," the two most common local anesthetics used in dentistry are 2% lidocaine hydrochloride and 2% mepivacaine. Each type of anesthetic is sealed in a 1.8-cc glass carpule. The needle end of each carpule is sealed with rubber membrane held in place by a metal band. The other end has a different colored rubber stopper. Each type of anesthetic has a different colored rubber stopper.

Assembling An Aspirating Syringe

Based on the patient's health history and the procedure to be performed, the dentist will inform you which type of anesthetic (including vasoconstrictor content), needle length, and needle gauge to use to prepare the syringe. You will become familiar with each dentist's preference and various procedures for needle length and gauge. However, always verify the type of anesthetic solution. Assemble the syringe out of the patient's view to reduce unnecessary patient apprehension. Assembly can be done while the dentist administers the topical anesthetic.

First, always check the carpule for cracks or suspended articles floating in the solution. If you find any, discard the carpule and notify the dental and dental supply to ensure other batches of anesthetic are usable. Disinfect the rubber diaphragm on the carpule before loading it in the syringe. **Do not** touch the rubber diaphragm after you disinfect it. Placing the carpule end in the aspirating syringe is fairly easy. Use the following steps:

- Use the thumb ring to pull the plunger back against the syringe body.
- Place the cartridge into the barrel of the syringe with the rubber stopper end in first, positioned toward the plunger.
- Break the seal on the needle container and remove only a small portion of the plastic needle cover.
- Insert the needle into the syringe and screw the hub onto the syringe.
- Engage the harpoon into the rubber stopper of the cartridge by holding the body portion of the syringe with one hand while lightly tapping the end of the thumb ring with your other hand.

CAUTION

Do not tap the thumb ring with too much force; this might cause the glass carpule to shatter.

- Make a quarter turn with the thumb ring to ensure that the harpoon is firmly engaged in the rubber stopper. If it is, the thumb ring will rotate back to its original position.
- Force a small, but visible amount of anesthesia through the needle to expel air.
- Loosen the needle cap, but keep the plastic needle covering in place until you pass the syringe to the dentist to guard against possible contamination.
- The plastic needle cover must be removed to check the syringe's operation and during the injection.

Passing and Receiving the Syringe

The dentist will be ready to administer the local anesthetic after the topical anesthetic is applied. The assistant passes the syringe with the needle cover in place. Hold the barrel of the syringe in your hand. Place the thumb ring of the syringe over the dentist's thumb and the finger grip between the dentist's index

and middle fingers. While you are still holding the syringe by the barrel, use the other hand to remove the needle cap.

After the dentist gives the injection, carefully remove the syringe by grasping the barrel and lifting the syringe out of the dentist's hand. Remember to exercise extreme caution when grasping the barrel of the syringe because the needle is exposed and contaminated. **DO NOT** attempt to recap the needle while the syringe is in the dentist's hand. If it is necessary to recap the needle, it must be done using some type of mechanical device or the one-handed scoop technique discussed in Volume I, Chapter 9, "Infection Control."

Disassembling the Aspirating Syringe

After the patient is dismissed, the syringe must be disassembled safely. It is vitally important to prevent needle sticks from the contaminated needle. It is advisable to first remove the carpule with the needle remaining in place. This provides an air vent to prevent the glass carpule from shattering. To unload the carpule, pull the piston rod back as far as possible to disengage the harpoon from the rubber stopper without pulling the stopper from the carpule. The carpule can then be easily removed from the syringe. Remove the used needle and dispose of it into a puncture-resistant container according to established infection control standards.

IRRIGATION AND ASPIRATION

Immediately after the dentist administers the local anesthesia, you will irrigate and aspirate the injection site. This is necessary because the anesthetic solution produces a bitter taste in the patient's mouth. Additionally, you are required to irrigate and aspirate (drawn by suction) often throughout the treatment procedure to maintain a clean treatment site.

Irrigation

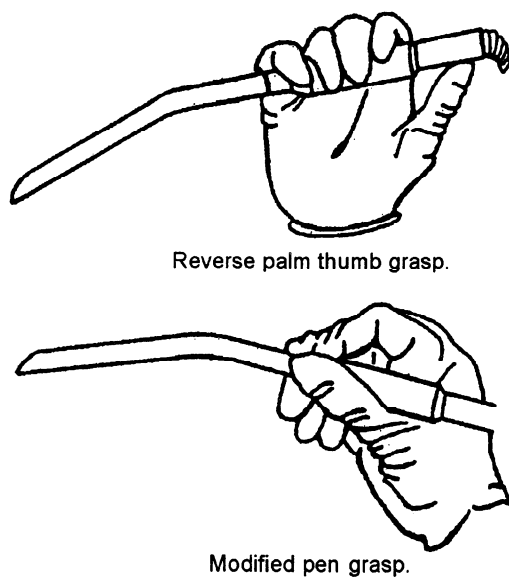
The dentist expects you, as the dental assistant, to irrigate the oral cavity when necessary. By applying water or saline solutions to the treatment site in the oral cavity, small tooth particles, dried blood, and other debris are flushed from the area and removed by aspiration. Handpieces with water spray systems provide some irrigation, but additional irrigation is always necessary. At times, the dentist may decide not to use the water spray system on the handpiece for a particular procedure. During routine operative procedures, you will use the three-way syringe on the

dental unit to irrigate the treatment site with water or water spray. The tip of the three-way syringe rotates easily to direct the water, spray, or air at the specific treatment sites. The tip disconnects to allow for sterilization.

When you irrigate treatment sites during surgical procedures, you will use a sterile saline solution or sterile water as the irrigation solution. Sterile saline or sterile water is applied by using a bulb-type or Luer (piston-barrel) syringe. The main purpose for irrigation during surgical procedures is to keep a clean treatment site. The cleansing is not complete until the irrigating solution is aspirated from the mouth.

Aspiration

Aspiration is necessary to remove blood, pus, saliva, and debris from the treatment site and oral cavity. This is done by using the high-volume evacuator (HVE) or saliva ejector. Figure 4-36 illustrates the reverse palm grasp and modified pen grasp that should be used when you are using the HVE. As the dental assistant, you must assure that a sterile or disposable tip is in place for each patient. When using either of these, always place the tip in the upright position before turning the aspiration off. This helps prevent materials from dripping out or clogging the hoses. You must also clean and maintain the evacuation system as instructed in the manufacturer's operation and maintenance instructions.



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Figure 4-36.—Reverse palm grasp and modified pen grasp using an HVE.

OPERATIVE PROCEDURES

Operative dentistry strives to restore decayed or fractured teeth to their original functional ability and esthetic quality of healthy dentition. In general, procedures include the following:

- Determining the procedure to be done
- Administering anesthesia
- Placing a rubber dam
- Preparing the cavity or cavities to be filled
- Placing filling material into prepared cavity preparations
- Carving and finishing restorations
- Smoothing and polishing restorations

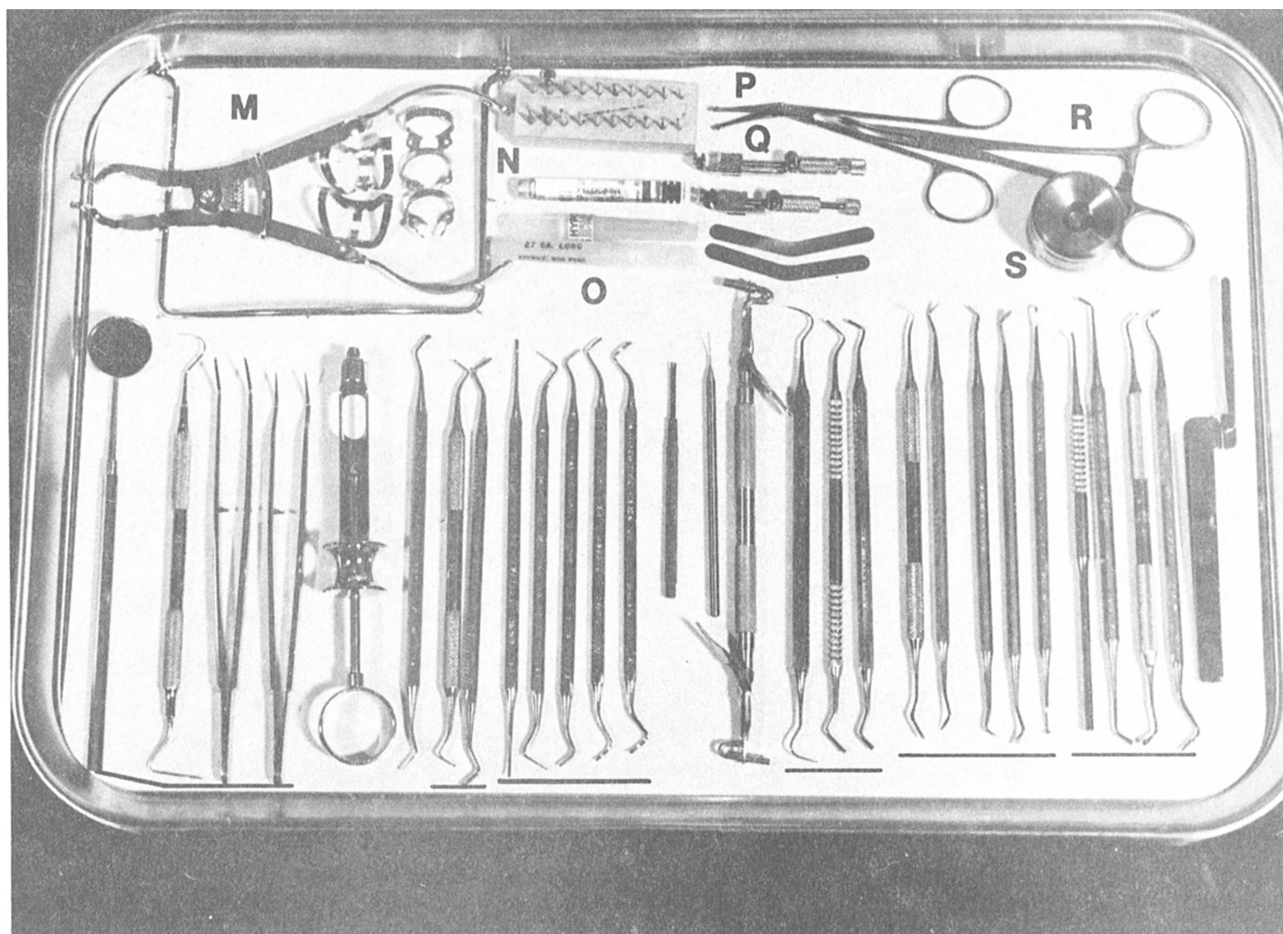
As an assistant in operative dentistry, you will perform many of the basic clinical procedures discussed earlier, such as:

- Preparing the dental treatment room (DTR)
- Performing proper infection control procedures
- Wearing appropriate personal protective equipment
- Selecting and arranging instruments and materials required for the procedure
- Receiving and preparing the patient
- Preparing local anesthetic
- Irrigating and aspirating throughout the procedure
- Retracting tissue to maintain a clear field of vision
- Preparing and assisting with the placement of the rubber dam
- Preparing, passing, and receiving instruments and materials

Figure 4-37 illustrates a typical selection and arrangement of instruments for a routine operative procedure. Items should be arranged in sequential order of the procedure to proceed smoothly without delay.

TERMINOLOGY AND CLASSIFICATION OF CAVITIES

For the necessary treatment procedures to proceed smoothly and without delay, you need to understand some basic terminology and classification of cavities.



- | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>A. BDS with extra cotton forceps
 B. Anesthetic Syringe
 C. Stellite
 D. Small and Large Spoon Excavators
 E. Handcutting Instruments
 Chisel, Hoe, Hatchet, Paired GMT's
 F. Pin Bender</p> | <p>G. Dycal Instrument
 H. Double Ended Amalgam Carrier
 I. Assorted Condensers
 J. Assorted Carvers
 K. Assorted Burnishers
 L. Articulating Forceps
 M. Rubber Dam Frame, Forceps, & Clamp</p> | <p>N. Burs
 O. Anesthetic Carpule & Needles
 P. Blunt Tipped Scissors
 Q. Toffelmire Retainers and Bands
 R. Curved Hemostat
 S. Amalgam Well</p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Figure 4-37.—Typical operative dentistry instrument tray setup.

A cavity preparation is a mechanical procedure that removes caries or existing restorative materials and a limited amount of healthy tooth structure to receive and retain restorative materials in the cavity preparation. A cavity wall is a side or surface of the cavity preparation that aids in enclosing the restorative material. You should already be familiar with the terms used to describe the various tooth surfaces, such as mesial, distal, lingual, facial, incisal, and occlusal. A bevel is a slanting of the enamel margins of the tooth

preparation cut at an angle with the cavity wall. There are numerous types of bevels, such as full, long, chamfer, and dovetail.

Cavities can occur on one or more surfaces, and can be of various sizes, ranging from very small to those that include all five surfaces of the tooth. Simply, cavities are those which occur on one surface of the tooth. When two surfaces of the tooth are involved, the cavity is called a compound cavity. A cavity is

considered a complex cavity when three or more surfaces are involved. Compound and complex cavities may include one or both of the proximal surfaces as well as portions of the facial and lingual surfaces. When caries attack the proximal surfaces of posterior teeth, the cavity preparation must also include preparation of the occlusal surfaces.

Cavities may be classified according to the location where the carious lesion begins. Caries frequently start in the developmental **pits and fissures** of the teeth. These areas are deeper than the surrounding tooth substance and are nearly impossible to clean thoroughly, creating ideal conditions for bacterial plaque formation. Locations of pit and fissure caries can be located in any of the following areas:

- Lingual pits of maxillary incisors
- Lingual grooves and pits of maxillary molars
- Occlusal surfaces of posterior teeth
- Facial grooves and pits of mandibular molars
- Pits occurring in areas because of irregularities in the formation of enamel

Smooth surface cavities can be found on all teeth on the proximal surfaces, and gingival one-third of the facial and lingual surfaces.

STEPS IN CAVITY PREPARATION

After the dentist decides which tooth or teeth to restore, the anesthesia is administered and the rubber dam placed. If you are well prepared, the steps in the cavity preparation should proceed smoothly without delay, and the patient will be more at ease and confident. Watch closely during the procedure and be ready to irrigate and aspirate as needed, as well as, pass the instruments and material to the doctor when needed. The initial cavity preparation generally is done using the high-speed handpiece and a variety of rotary instruments.

Cavity Design

The design of the cavity preparation for either a tooth with initial caries or replacement restoration is based on the location of the caries, the amount and extent of the caries, the amount of lost tooth structure, and the restorative material to be used.

Some basic principles should be considered when preparing a cavity preparation. The dentist must

establish an **outline form**, which determines the overall shape of the preparation along the cavity margins of the restoration and the tooth surfaces. The outline form is determined by the size and shape of the carious lesion and by the need for a suitable design that will hold a restoration firmly in place. Usually, the dentist is able to visualize the shape of the completed cavity before cutting the preparation by viewing the extent of the caries on the radiograph and examining the tooth and soft tissues.

Removal of Remaining Caries

Carious dentin not removed during the design of the cavity preparation is removed by using either round burs or spoon excavators. When the dentin has a firm feel with the explorer, removal of the tooth structure should cease, even if stained dentin remains.

Finishing the Enamel Walls and Margins

The last cutting step in the preparation of the cavity is finishing the enamel walls. This is a process of angling, beveling, and smoothing the walls of the cavity preparation to achieve the best marginal seal possible between the restorative material and tooth structure. The dentist may use burs, diamond stones, or hand-cutting instruments (chisels, hoes, hatchets, and gingival margin trimmers) to complete the walls by removing loose or unsupported enamel to create the strongest possible enamel wall.

Cleansing the Cavity

The final step in cavity preparation is cleansing the cavity. This includes the removal of accumulated debris, drying the cavity, and final inspection before placing restorative materials. All debris must be removed from the cavity, especially on the margins, because deposits left on them subsequently dissolve, resulting in a leak that invites recurrent caries.

Irrigating the cavity preparation with warm water usually removes all debris. Stubborn particles of debris may be removed with a small cotton pellet dampened with water or hydrogen peroxide. Following irrigation and aspiration to remove the debris, the cavity must be dried thoroughly with pressurized air from the 3-way syringe or dry cotton pellets.

Placement of Restorative Materials

After the cavity preparation is completed, your attention as the assistant is especially critical. You must rapidly anticipate each step in the procedure to have the necessary material ready at the proper time. You must prepare and pass restorative materials, mix them at the right time, and follow the manufacturer's instructions. More instruments are needed to place the restoration than to prepare the tooth; therefore, more instrument transfers are necessary and occur more rapidly than in cavity preparation. Once the restorative materials have been placed in the oral cavity, the dentist then begins to finish the restoration.

CAVITY LINERS AND BASES.—Most dentists use some type of cavity liner or base in almost all cavity preparations. They are used primarily to **protect the pulp and to aid the pulp in recovering from irritation resulting from cavity preparation.** Liners and bases are placed when the cavity preparation is completed, just before insertion of the restorative material.

Glass ionomer cements and dentin bonding agents are used primarily to seal the dentin and protect the pulp from bacterial invasion. Calcium hydroxide can be used in extremely deep areas as an antibacterial agent and/or as a pulp capping material.

Most bases are applied best when the assistant wipes the instrument clean between each small application. You will hold a gauze sponge in the transfer zone and quickly wipe the end of the instrument as the dentist moves toward the base mix. If the dentist inadvertently gets the base on the enamel walls of the cavity preparation, you will pass an instrument for removal of the material.

Cavity varnish is a liner used to seal the dentinal tubules to help prevent microleakage and is placed in a cavity to receive amalgam alloy after any bases have been placed. Cavity varnish is being used less and less with amalgam restorations, and dentin bonding agents are replacing cavity varnish as the liner of choice. Cavity varnish has an organic solvent of ether or chloroform that quickly evaporates, leaving the resin as a thin film over the preparation. This varnish should be slightly thicker than water. If it becomes very thick, discard it. Cavity varnish is **not used** with composites since the varnish retards the set of composites and interferes with the bonding of composites.

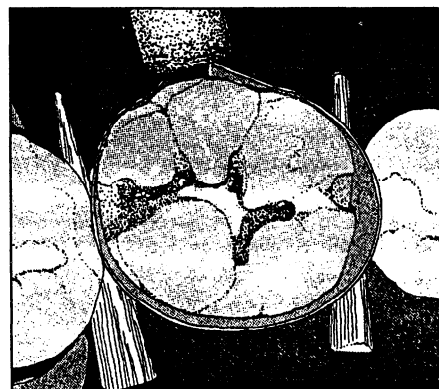
A small cotton pellet held by cotton forceps is dipped into the varnish just enough to wet the pellet.

The cavity varnish is applied to the pulpal area, walls of the cavity preparation, and onto the edge of the margins of the preparation. Any excess varnish can be removed from the enamel with a fresh cotton pellet. A second application of cavity varnish is placed over the first to thoroughly coat the surfaces of the dentin and fill any voids from bubbles created when the first application dries. After liners and bases are placed into the cavity preparation, the tooth may be restored with materials, such as amalgam, composite resin, or glass ionomer.

AMALGAM RESTORATIONS.—Amalgam is used as a restorative material on the surfaces of both permanent and primary teeth. Amalgam also is aesthetically acceptable for distal restorations of the cuspid when the restoration is not readily visible. Amalgam can also be used to prepare a sound base for a tooth before the preparation of a full artificial crown. This is commonly referred to as an amalgam buildup.

When multiple surfaces of the tooth are removed during the cavity preparation, a matrix is required to approximate the original wall and hold the restorative material in proper form and position until it sets. During the final stages of the cavity preparation, if not sooner, you should acknowledge the need for the matrix band and assemble it. While the liner and base materials set, the dentist places the assembled matrix band and retainer around the tooth, along with wedges if needed. Figure 4-38 illustrates a properly contoured and wedged matrix band.

While the dentist makes the final adjustments to the matrix, you will need to ensure the precapsulated amalgam is placed securely in the amalgamator and ready to triturate (mix). The operation and maintenance of the amalgamator is discussed in chapter 11, Volume 1, under Dental Equipment. Wait for a signal from the dentist to begin mixing the



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Figure 4-38.—Properly contoured and wedged matrix band.

amalgam. When the amalgamator stops, remove the amalgam capsule for the amalgamator, open the capsule, and empty the mixed amalgam into the amalgam well. Use caution with the amalgam mix because any moisture contamination causes the finished restoration to expand. Load the amalgam into the amalgam carrier (fig. 4-39). Some dentists permit the assistant to dispense the amalgam into the cavity preparation. Other dentists prefer to have you pass the loaded amalgam carrier and dispense the amalgam themselves. In either case, you must pass the amalgam condenser to the dentist. The dentist uses the condenser to pack the amalgam firmly into all the areas of the prepared cavity. During the condensing procedure, the dentist indicates when a change of condensers is needed. As you gain experience, you will know when a change is needed by observing the stage of completion. The exchange of amalgam carrier and condensers continues until the cavity preparation is slightly overfilled. When the condenser is used for the last time, the dentist may use a burnisher and or an explorer on the restoration before removing the matrix band.

The dentist uses a burnisher to bring any excess mercury from the amalgam placed to the top of the restoration. Next the explorer is used to slightly contour the restoration between the tooth and the band before removal of the matrix and retainer. For dentists who choose to initially carve the occlusal anatomy into the restoration before removal of the matrix, have an amalgam carver ready to pass when you receive the explorer. You will also need to have the cotton forceps

or hemostat ready to pass when the dentist is ready to remove the wedge, retainer, and matrix band.

The dentist uses an interproximal carver to smooth the gingival margin of the amalgam restoration at the interproximal area. Only the excess amalgam is removed near the gingival margin to allow the proximal contact to be retained. The dentist continues carving the proximal surfaces to conform to the contour of the inter-proximal area of the tooth. The dentist uses another carver, such as the discoid-cleoid, to carve the primary grooves on the occlusal surface and remove excess amalgam. You may need to have another carver ready to pass to the dentist to carve the facial and lingual margins of the amalgam, if applicable. In addition to passing and receiving a variety of carvers to the dentist, you will need the high-volume evacuator (HVE) tip in your other hand to aspirate the shavings from the carving procedure at various times. When carving the amalgam restoration is completed, remove the rubber dam. Irrigate and aspirate the patient's mouth and check the occlusion of the new restoration for any needed adjustments.

Have the articulating paper ready for use by placing it into a hemostat or articulating paper holder. Pass this to the dentist to check the occlusion of the restoration. The articulating paper is placed in the teeth of the opposing quadrant and the patient is instructed to gently close the teeth together. If the patient closes the teeth together too suddenly or with too much pressure, the new amalgam restoration will fracture if it is too high. Have an amalgam carver ready to pass to the dentist to reduce any high spots on the amalgam restorations. The restoration is checked with the articulating paper and carved until the proper occlusion is obtained. Have a burnisher, such as a ball or ovoid, ready to pass to the dentist to burnish the amalgam restoration. When the restoration is completed, the oral cavity is irrigated and aspirated using the water syringe. Use the HVE to remove amalgam shavings resulting from the occlusal adjustment. Before dismissal, ensure the patient is given the postoperative instructions and understands them.

MERCURY CONTROL PROGRAM FOR DENTAL TREATMENT FACILITIES.—All dental personnel will follow BUMEDINST 6260.30 because of the health hazard potential of mercury. This instruction discusses control procedures for the handling and disposal of amalgam or mercury-contaminated items and is discussed in Volume I, Chapter 11, "Dental Safety and Equipment."

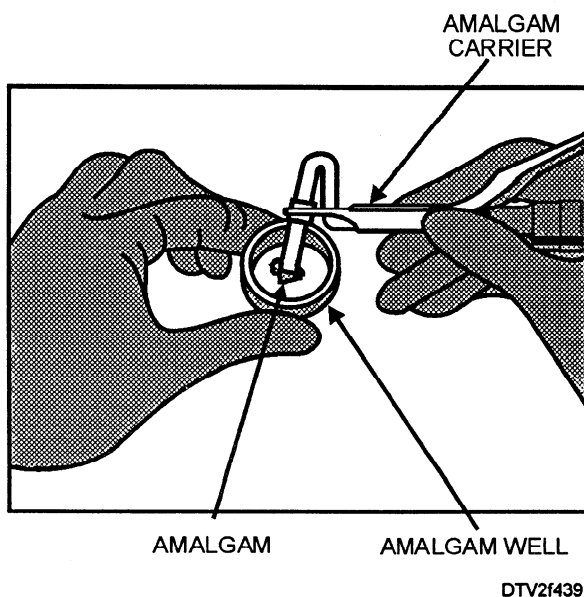


Figure 4-39.—Loading amalgam into the amalgam carrier from amalgam well.

FINISHING AND POLISHING AMALGAM RESTORATIONS.—When amalgam restorations are placed in the tooth, finishing and polishing of the restorations generally take place at another appointment. The appointment should be at least 24 hours after the placement of the amalgam. Polishing the amalgam smooths the surface so that plaque does not adhere to it readily and makes the restoration look more attractive. The dentist checks the margins and proximal contacts of the restoration initially. A metal filing strip can be used to remove any roughness or overhand of the restoration in the proximal area. The dentist may use finishing burs or stones in the handpiece, followed by discs and abrasive points. Before use, discs may be coated with a lubricant, or in some cases, wet with water. The abrasive points progress from a more-abrasive to a less-abrasive point until a smooth mirror-like surface is obtained on the amalgam restoration. Extra-fine pumice and dry tin oxide, or commercial silicone-mounted polishing cups, may be used for a final polishing.

COMPOSITE RESIN RESTORATIONS.—The restoration of tooth surfaces that are normally easily visible are restored with tooth-colored restorative materials for an esthetic appearance. One of the most commonly used tooth-colored restorative materials is the composite resin. The three types of composite resins available are

- macrofilled,
- microfilled, and
- hybrid.

The classification of each composite resin depends on the particle size of its inorganic filler. The macrofilled and hybrid resins have higher amounts of inorganic fillers and lower amounts of organic resin than the microfilled resins. This provides the strength needed for proximal-incisal restorations. These restorations may be prepared with or without the pin retention technique. On the other hand, because microfilled resins have a smaller particle size, they are easier to polish than macrofilled resins. Many of the recently developed hybrids achieve good polishability and esthetics—one reason for their increased popularity.

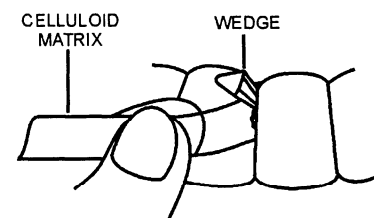
Composite resin materials are available in **self-curing two-paste systems** and **light-curing single-paste systems**. Some brands offer several color selections; whereas, others are supplied in a universal shade. The shade must always be selected before the

teeth are allowed to dry because dehydration results in lighter shades.

The restorative material is retained in the cavity preparation by mechanical retention. Chipped or fractured teeth rely mostly on acid-etch enamel for retention of the restorative material. Acid-etching the enamel portion of cavity preparations with a 35 to 50 percent solution of phosphoric acid results in improved retention for resin restorations. A celluloid matrix may be placed before the acid-etching procedure to protect the adjacent teeth. The phosphoric acid is applied to the enamel surface of the cavity preparation and is allowed to be in contact with the enamel for 1 minute. Then the area is rinsed thoroughly with water and dried. The etched enamel surface, when dried, appears chalky white because of a slight dissolving of the surface enamel that leaves microscopic undercuts (retention). After etching the tooth, a bonding agent is applied.

The dentist may need an instrument to pack the composite resin material into the cavity preparation and to avoid formation of air bubbles. When the composite resin material is applied to the etched and bonded surface, the resin invades the surface void, undercuts, and irregularities. When surfaces in the proximal area are restored, the dentist will place a celluloid matrix that will assist in preventing the composite material from adhering to adjacent teeth and also acts as a form to properly place the material (fig 4-40). If using a light-cured system of composite resin, the light source is positioned near the restoration and exposed according to the manufacturer's instructions. These light-curing systems are discussed in Chapter 11, Volume I, "Dental Safety and Equipment." The dentist, assistant, and the patient should wear protective glasses during the light exposure.

Once the resin material cures, a mechanical bond forms. This type of surface union between the restorative material and the enamel improves the retention qualities and provides a smoother cavity



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Figure 4-40.—Using a celluloid matrix for a proximal composite restoration.

margin, improving the esthetics of the restoration. In addition, less marginal leakage is likely to occur because of the improved union of the enamel and restoration.

To finish the restoration, the matrix is removed and any rough areas are smoothed with composite-type finishing burs. If the restoration involves proximal surfaces, abrasive strips similar to those shown in figure 4-41 are used to smooth these surfaces. If applicable, the gingival margin of the restoration is checked to remove any excess composite material. The surface of the restoration is smoothed further with a fine and an extra-fine disc of silicon carbide and zirconium silicate. These smooth surfaces prevent retention of food debris or plaque. If a higher gloss of the facial surface is desired, a coating of sealant material is placed over the finished restoration. After completion of the restoration, the rubber dam is removed and oral cavity irrigated and aspirated. If necessary, the dentist checks the occlusion and makes adjustments.

GLASS IONOMER RESTORATIONS.—

Usually, the gingival areas on the facial aspect of the maxillary anterior teeth are restored with one of the tooth-colored restorative materials for an esthetic appearance. Restorations located on the gingival third of the tooth may be necessary because the tooth is carious or because it has been worn away or abraded by incorrect brushing habits. Since glass ionomer cements bond directly with enamel, dentin, and cementum, they may be used for such restorations where minimal preparation of the tooth is desired, or where the fluoride release from the cement is desired to resist recurrence of caries. During placement of the glass ionomer cement restoration, the cavity area must be kept totally dry because moisture will cause a failure of the restoration.

SUPPLY PROCEDURES

A competent dental assistant can increase the efficiency, productivity, and reduce the operational

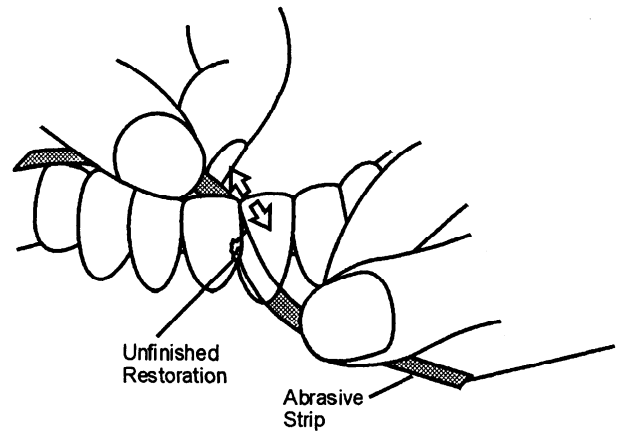


Figure 4-41 .-Using an abrasive strip to finish a proximal surface.

costs in a DTR by using proper supply procedures. It costs time and money to run out of necessary items. It is also wasteful and expensive to order and store items that are never used.

You will use a supply catalog to order supplies. Some facilities make up a catalog for local use, listing frequently ordered items.

To order an item, look it up in the catalog and then fill out the appropriate "request for issue" form. These forms may vary slightly in format but they all require the same basic information. It is important that you fill out the form accurately and completely. It is important to know item nomenclature, identification, and distribution data.

When your supplies arrive, check the items against your order form to ensure you receive the items and quantities that you ordered. Also check broken seals or loose parts. If you discover anything out of the ordinary, notify your supervisor. After supplies have been checked, store them in a manner consistent with the manufacturer's instructions to prevent spoilage or damage.

